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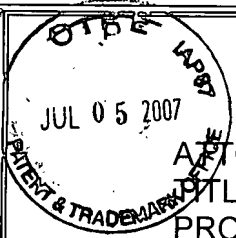
<b>TRANSMITTAL FORM</b> <i>(to be used for all correspondence after initial filing)</i>	<b>Application Number</b>	10/644,255
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	<b>First Named Inventor</b>	MARK CULLEN
	<b>Group Art Unit</b>	1764
	<b>Examiner Name</b>	
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ATTORNEY DOCKET NO: CULLN-001B  
TITLE: TREATMENT OF CRUDE OIL FRACTIONS, FOSSIL FUELS, AND  
PRODUCTS THEREOF

Serial Number: 10/644,255

Filed: August 20, 2003

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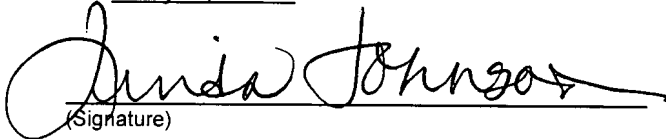
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Application No.: 10/644,255  
Attorney Docket: CULLN-001B

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants:	Mark Cullen	)	Confirmation No.	6075
		)		
Serial No.:	10/644,255	)	Art Unit:	1764
		)		
Filed:	August 20, 2003	)	Examiner:	Tam M. Nguyen
		)		
For:	Treatment of Crude Oil Fractions,	)		
	Fossil Fuels & Products Thereof	)		

**REPLY BRIEF UNDER 37 C.F.R. § 41.41**

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Dear Sir/Madam:

Appellant is submitting this Reply Brief under 37 C.F.R. § 41.41 in response to the Examiner's first Answer of February 14, 2007, the Examiner's second Answer of February 22, 2007 (which reiterates the previous Answer verbatim except for the deletion of a single paragraph), and the Examiner's third Answer of June 28, 2007 in regard to the above-referenced patent application.

If for any reason any additional fee is necessary, the Commissioner is authorized to charge the appropriate fee for the Appeal Brief and/or any necessary extension of time fees to Deposit Account Number 19-4330.

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**I. REAL PARTY IN INTEREST**

The real party in interest is Petrosonics, LLC by assignment recorded in the U.S. Patent and Trademark Office on April 18, 2006 at Reel 017486, Frame 0704.

## **II. RELATED APPEALS AND INTERFERENCES**

Appeals are pending on United States Patent Application Numbers 10/411,796 and 10/429,369, which have the same Applicant, are owned by the same Assignee, and are directed toward similar subject matter. Also, although now dismissed, a complaint was filed by SULPHCO, INC., a Nevada corporation, against MARK CULLEN, the inventor of the here-appealed application. The complaint, assigned Case No. CV06-01490, was filed on June 26, 2006, in the Second Judicial District Court of the State of Nevada in and for the County of Washoe and concerned the ownership of the here-appealed application. The complaint was dismissed, by stipulation between the parties, on April 26, 2007.

### **III. STATUS OF CLAIMS**

Claims 1-39 were cancelled prior to the filing of the Notice of Appeal. Claims 40-88 stand rejected pursuant to the reopening of prosecution as set forth in the non-final Office Action dated August 8, 2006, which was again issued on September 5, 2006 with the requisite signature of a Supervisory Patent Examiner, per M.P.E.P. §1207.04. Claims 40-88 are hereby being appealed.

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#### **IV. STATUS OF AMENDMENTS**

Appellant's Amendment filed on March 20, 2006, after the final rejection, was entered by the Examiner prior to the first appeal.



**V. SUMMARY OF CLAIMED SUBJECT MATTER**

The independent claims of the present application relate to processes for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, wherein the upgrade is effected by heating the crude oil fraction while simultaneously exposing it to sonic energy in specific types of reaction mediums. *See specification p. 9, lines 5-11; specification p. 5, lines 15-19.* More particularly, the process claimed in independent Claim 40 includes the presence of an oxidizing agent and the absence of an aqueous phase. *See specification p. 5, lines 15-19; specification p. 10, line 31 through p. 11, line 2.* The process claimed in independent Claim 58 includes the presence of an oxidizing agent and the absence of a surface active agent. *See specification p. 5, lines 15-19; specification p. 11, lines 16-17.* The process claimed in independent Claim 76 includes the absence of an oxidizing agent. *See, e.g., specification p. 6, lines 19-23.*

**VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

- A. Whether the Examiner's arguments in the Answer are persuasive and adequately support the rejections.
- B. Whether Claims 40-57 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,500,219 to Gunnerman (hereinafter "Gunnerman");
- C. Whether Claims 58-75 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Gunnerman;
- D. Whether Claims 78-88 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Gunnerman;
- E. Whether Claims 76 and 83-88 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,616,375 to Inoue (hereinafter "Inoue");
- F. Whether Claims 77-81 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue in view of Gunnerman; and
- G. Whether Claim 82 is improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue alone or in view of Gunnerman.
- H. All other rejections not cited above have been expressly withdrawn by the Examiner in the Answer.

## VII. ARGUMENT

**A. The arguments presented in the Examiner's Answer are unpersuasive and do not adequately support a rejection; accordingly, the Board should reverse the rejection and remand the subject application to the Examiner with instructions to allow all presently appealed claims.**

For the sake of completeness, Appellant's arguments presented in the Appeal Brief are being resubmitted in their entirety below (minus those in relation to the rejections withdrawn by the Examiner) pursuant to M.P.E.P. § 1208. This section, however, exclusively addresses the Examiner's Response to Argument presented in the Examiner's Answer of February 14, 2007 (hereinafter "First Answer"), the Examiner's near verbatim Answer of February 22, 2007 (hereinafter "Second Answer"), and the Examiner's substantially similar Answer of June 28, 2007 (hereinafter "Third Answer"). As it is the most recent of the three, all citations and references will be to the Third Answer.

It is noted that aside from formatting changes, the only substantive difference between the First Answer, the Second Answer, and the Third Answer is within Section 10, the Examiner's Response to Argument. It is further noted that the Examiner admits that the process of Gunnerman involves upgrading a hydrocarbon feed by utilizing sonic energy *with an aqueous phase, a surface active agent, and oxidizing agent*. *Third Answer, Page 7.* The Examiner further admits that the presently appealed claims are *"vastly different"* from the originally filed claims which required addition of a hydroperoxide oxidizing agent and the separation of nitrogen and sulfur compounds. Appellant would like to respectfully

submit, however, that it is the claims on appeal that are at issue, and not the originally filed claims.

i. The Examiner's Contention That the Gunnerman Process Could Properly Be Conducted "In the Absence of an Aqueous Phase"

The Examiner admits that Claim 40, as currently recited, specifically excludes an aqueous phase. *Third Answer, Page 7.* The Examiner, however, contends that, "an upgrading product as claimed would still obtain from the process of Gunnerman when an aqueous phase is omitted from the process because an aqueous phase is only to improve the effectiveness and efficiency of the process." *Id.* The Examiner further contends that, "the separation would still occur, but it would not be easily and ready [sic] as compared when it is involved with an aqueous phase." *Id.* (emphasis added). The Examiner further contends that in light of Appellant's arguments made in regard to a withdrawn § 112 rejection concerning the addition of H<sub>2</sub>O<sub>2</sub>, "the meaning of 'in the absence of an aqueous phase' per claim 40 is therefore inclusive of an aqueous phase and therefore embrace [sic] by Gunnerman." *Id. at 8.* Finally, the Examiner incorrectly construes Appellant's invention as involving, "a process for upgrading a hydrocarbon feed (e.g., fossil fuels) by utilizing a sonic energy with, optionally, an aqueous phase, a surface active agent, and an oxidizing agent. *Id.* Actually, independent Claim 40 recites, "A process ... comprising the step of heating said crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of an aqueous phase;" independent Claim 58 recites, "A process ... comprising the step of heating said crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of a

surface active agent,” and independent Claim 76 recites, “A process ... comprising the step of heating said crude oil fraction in the absence of an oxidizing agent while exposing said crude oil fraction to sonic energy.” As such, a more accurate description of Appellant’s invention as currently claimed is a process for upgrading a hydrocarbon feed (e.g., fossil fuels) by utilizing a sonic energy with an oxidizing agent and in the absence of an aqueous phase; with an oxidizing agent and in the absence of a surface active agent; or in the absence of an oxidizing agent. Thus, each claim requires that at least one component from the group consisting of an oxidizing agent, a surface active agent, or an aqueous phase, must be absent from the process; which is clearly not the same as the Examiner’s interpretation that the process may, “optionally [include] an aqueous phase, a surface active agent, and an oxidizing agent.” *Id.*

a. *The Examiner does not provide any evidence that an aqueous phase is used in the Gunnerman process only to improve the effectiveness and efficiency of the process*

The Examiner submits that it would have been obvious to eliminate the aqueous phase from the Gunnerman process to reach Appellant’s claimed invention since the, “aqueous phase is only to improve the effectiveness and efficiency of the process.” To support this contention, the Examiner cites *Ex parte Wu* for the proposition that the omission of an element and its function is obvious if the function of the element is not desired. In *Ex parte Wu*, however, the Board affirmed the Examiner’s finding that it would have been obvious to omit a prior art element when the function attributed to that element is not desired or required. 10 U.S.P.Q.2d 2031, 2032 (BPAI 1989). As discussed in Appellant’s Appeal

Brief and reiterated below, however, the function of the Gunnerman process is the separation of aqueous and organic phases, which obviously cannot be achieved without the presence of an aqueous phase. As such, the elimination of the aqueous phase from the Gunnerman process would not be the elimination of an undesired function and therefore the citation of *Ex parte Wu* by the Examiner is not on point.

Furthermore, the Examiner has not cited any teaching or suggestion within the Gunnerman reference for his assertion that the presence of the aqueous phase is only to improve the effectiveness and efficiency. In actuality, Gunnerman requires the presence of an aqueous phase because the Gunnerman process effectuates the removal of sulfur by allowing the aqueous and organic phases to separate after a sonic energy treatment, wherein the aqueous phase ultimately contains the sulfur products. Col. 2, lines 26-44. As opposed to the Examiner's bald assertion that the aqueous phase only serves to improve the effectiveness and efficiency of the process, an aqueous phase is essential to Gunnerman because it is the means by which the oxidized sulfur is extracted from the fossil fuel. Col. 3, lines 1-5. As such, this mere assertion by the Examiner cannot be a proper basis for an obviousness rejection since it is well known that the fact that a reference can be modified is not sufficient to establish *prima facie* obviousness. *M.P.E.P.* § 2143.01. In fact, the Court of Appeals for the Federal Circuit has explicitly held that even though a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." *In re Mills*, 916 F.2d 680, 682, 16 U.S.P.Q.2d 1430, 1432 (Fed. Cir. 1990). No suggestion or motivation has been provided by the Examiner because the removal of the aqueous phase from the Gunnerman process would

render the Gunnerman process incapable of achieving its intended result of removing sulfur compounds from a fossil fuel.

Additionally, it is well settled that a proposed modification cannot render the prior art unsatisfactory for its intended purpose. *M.P.E.P. § 2143.01*. In a case similar to the present matter, the Board's finding that a blood filter device, having an inlet and outlet at the bottom, was obvious in light of a prior art gasoline filter device, having the inlet and outlet at the top and a stopcock for removing water and dirt at the bottom, was overturned by the Federal Circuit because if the reference was turned upside down to reach the claimed invention the water and dirt would flow through the output and it would be inoperable for its intended purpose. *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). Similarly, if the Gunnerman process is modified to remove the aqueous phase, as the Examiner proposes, it would be inoperable for its intended purpose of separating the sulfur from the organic phase into the aqueous phase.

The Examiner has not shown any motivation within the Gunnerman reference for modifying the process to remove the required component of an aqueous phase. Furthermore, any such change would render the Gunnerman process unsatisfactory for its intended purpose. Accordingly, the Examiner has not met his burden of factually supporting a *prima facie* conclusion of obviousness.

b. *The Examiner incorrectly points to a separation process,  
thereby misconstruing the presently claimed invention*

The Examiner submits that the separation present in the Gunnerman process would still occur even in the absence of an aqueous phase. Even if this were true, which the

Appellant does not concede, this argument merely illustrates the Examiner's continuing misinterpretation of Appellant's pending claims. Appellant's independent claim 40 recites, "A process for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, said process comprising the step of heating said crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of an aqueous phase." *There is no recital in the claim of "a separation."* This is true, because *Appellant's claim is directed toward a method of upgrading a crude oil fraction, not for separating sulfur from the crude oil fraction* as the Examiner apparently believes. As such, the Examiner's contention that the separation in the Gunnerman process would still occur even in the absence of an aqueous phase is meaningless since Appellant's claim does not require any separation to occur.

*c. The Examiner incorrectly construes the limitation of "in the absence of an aqueous phase"*

The Examiner points to Appellant's discussion in the Appeal Brief regarding a withdrawn § 112 rejection as evidence that the limitation in claim 40 of the process being conducted "in the absence of an aqueous phase" would allow for the presence of an aqueous phase as contemplated in the Gunnerman process. Appellant previously argued that, "a person skilled in the art would understand the limitation of 'in the absence of an aqueous phase' to allow for the addition of a reagent, such as hydrogen peroxide, in an aqueous carrier that creates at most a negligible aqueous phase." In order to show how negligible this amount may be, Appellant pointed out that Appellant's specification disclosed that "hydrogen peroxide, if present at all, can be present in an amount as low as 0.0003% by



volume,” with an accordingly even smaller percentage of water being present. The Examiner’s reasoning that these statements would permit Appellant’s claim, wherein the process is conducted “in the absence of an aqueous phase,” to allow for the presence of the aqueous phase utilized in the Gunnerman process is inaccurate for at least two reasons.

First, Appellant’s claim 40 recites that the process is conducted, “in the presence of an oxidizing agent,” while Appellant’s claim 41 recites that the “oxidizing agent is hydrogen peroxide or a hydroperoxide.” Due to the principle of claim differentiation, claim 40 must include oxidizing agents other than hydrogen peroxide or hydroperoxides in order for claim 41 to not be duplicative of claim 40. Accordingly, claim 40 may not include an aqueous phase at all, even a negligible one introduced by a hydrogen peroxide solution. As such, Appellant’s claim 40 would not allow for the presence of an aqueous phase as is required in the Gunnerman process.

Second, Appellant’s arguments were merely stating that a miniscule amount of water inserted into the process as a carrier for another reagent would not defeat the limitation of “in the absence of an aqueous phase.” This is vastly different than the aqueous phase utilized in the Gunnerman process. Although it is not explicitly stated what the minimum level of an aqueous phase may be in the Gunnerman patent, it is stated that “best results will be achieved when the volume ratio of fossil fuel to aqueous fluid is from about 8:1 to about 1:5.” *Column 4, lines 44-45*. This amount of water disclosed in the Gunnerman patent is much greater than that described in Appellant’s argument of hydrogen peroxide in an amount of 0.0003% by volume, with an even lower amount of water being present. Further, the *Gunnerman patent explicitly recites the requirement of both an aqueous fluid and a hydroperoxide oxidizing agent*. See e.g., *Column 2, lines 30-31 and 37; Abstract*. The fact that Gunnerman recites

the elements of an aqueous phase and a hydroperoxide separately would indicate that Gunnerman intended for an aqueous fluid to be present in the process in an amount larger than that merely of the hydroperoxide solution. As such, the aqueous fluid utilized in the Gunnerman process would be outside the scope of Appellant's claims that include the limitation of being conducted "in the absence of an aqueous phase." As such, the Examiner has failed to meet his burden of establishing a *prima facie* conclusion of obviousness.

ii. *The Examiner's Contention That the Gunnerman Process Could Properly Be Conducted "In the Absence of a Surface Active Agent"*

The Examiner contends that the Gunnerman process uses a surface active agent to create an emulsion that enhances the separation process and that the separation process would still occur, albeit less readily, without the presence of a surface active agent. *Third Answer, Page 9*. The Examiner also construes the limitation of "in the absence" to allow for the presence of the material in an amount of 0.0003% of the volume, and therefore the volume ratio of mineral oil recited in Gunnerman of 0.00003 to about 0.003 would read on Appellant's claims reciting "in the absence of a surface active agent." *Id. at 9-10*.

a. *The Examiner incorrectly points to a separation process, thereby misconstruing the presently claimed invention*

The Examiner submits that the separation present in the Gunnerman process would still occur even in the absence of a surface active agent. Even if this were true, which the Appellant does not concede, this argument again merely illustrates the Examiner's misinterpretation of Appellant's pending claims. Appellant's independent claim 58 recites,

“A process for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, said process comprising the step of heating said crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of a surface active agent.” There is no recital in the claim of “a separation.” This is true, because *Appellant’s claim is directed toward a method of upgrading a crude oil fraction, not for separating sulfur from the crude oil fraction as the Examiner apparently believes.* As such, the Examiner’s contention that the separation in the Gunnerman process would still occur even in the absence of a surface active agent is meaningless since Appellant’s claim does not require any separation to occur.

b. *The Examiner incorrectly construes the limitation of “in the absence of a surface active agent”*

As discussed above, Appellant argued in the Appeal Brief that one of ordinary skill in the art would understand the limitation of “in the absence of an aqueous phase” to allow for the addition of a reagent in an aqueous solution wherein the resulting aqueous phase is negligible due to the small amount of such reagent added.

In no way did Appellant argue that the limitation “in the absence of” any component would allow for the addition of that component provided it was a small amount. The aqueous phase argument is different because, as discussed above, *the Gunnerman patent explicitly calls for both an aqueous phase and a hydroperoxide* thereby insinuating that the addition of an aqueous phase is separate from the addition of a hydroperoxide in an aqueous solution. The aqueous phase argument is also different because components may be present in an “aqueous solution,” whereas they would not be present in a “surface active agent

solution.” As such, one skilled in the art would not interpret a limitation of “in the absence of a surface active agent” to allow for the presence of a negligible amount of a surface active agent as one skilled in the art would interpret the limitation of “in the absence of an aqueous phase” to allow for the addition of a component in an aqueous solution.

Furthermore, even if the Examiner’s interpretation that “in the absence” of a component would allow for the component to be present in an amount as low as 0.0003% by volume is proper, which Appellant does not concede, the Gunnerman process still does not fall within this limitation. As the Examiner admitted, Gunnerman teaches that the ratio of a surface active agent to a fossil fuel may range from 0.00003 to about 0.003. This range does not encompass an amount of 0.0003%, since a percentage must be divided by 100 in order to reach the equivalent ratio. As such, the ratio that the Examiner asserts would be allowable under Appellant’s “definition” would be 0.000003, which is an amount different than that taught by Gunnerman to the effect of a magnitude of ten. Accordingly, even if the Examiner’s interpretation was correct that “in the absence of” allowed for the component to be present in an amount as low as 0.000003, this was not taught or suggested by the Gunnerman patent. Therefore, the Examiner has failed to meet his burden of establishing a *prima facie* conclusion of obviousness.

iii. The Examiner’s Contention That the Gunnerman Process Could Properly Be Conducted “In the Absence of an Oxidizing Agent”

The Examiner construes the limitation of “in the absence” to allow for the presence of the material in an amount of 0.0003% of the volume, and therefore the recitation in Gunnerman of an oxidizing agent used in an amount from about 0.0003% by volume would

read on Appellant's claims reciting, "in the absence of an oxidizing agent." *Third Answer,*  
*Page 10.*

a. ***The Examiner incorrectly construes the limitation of "in the absence of an oxidizing agent"***

As previously discussed, Appellant argued in the Appeal Brief that one of ordinary skill in the art would understand the limitation of "in the absence of an aqueous phase" to allow for the addition of a reagent in an aqueous solution wherein the resulting aqueous phase is negligible due to the small amount of such reagent added.

In no way did Appellant argue that the limitation "in the absence of" any component would allow for the addition of that component provided it was a small amount. The aqueous phase argument is different because, as discussed above, the Gunnerman patent explicitly calls for both an aqueous phase and a hydroperoxide, thereby insinuating that the addition of an aqueous phase is separate from the addition of a hydroperoxide in an aqueous solution. The aqueous phase argument is also different because components may be present in an "aqueous solution", whereas they would not be present in an "oxidizing agent solution." As such, one skilled in the art would not interpret a limitation of "in the absence of an oxidizing agent" to allow for the presence of a negligible amount of an oxidizing agent as one skilled in the art would interpret the limitation of "in the absence of an aqueous phase" to allow for the addition of a component in an aqueous solution.

iv. *The Examiner's Contention That the Inoue Process Could Be Modified to Include Heating the Crude Oil Fraction*

The Examiner has corrected the rejection of Claims 76 and 83-88 as being a § 103(a) rejection and not a § 102(b) rejection. The Examiner admits that Inoue teaches processing the petroleum liquids without substantially heating them; however, the Examiner makes the unsubstantiated assumption that this is done to save energy and that if an energy supply "is ready and really cheap," one would preheat the petroleum to improve the efficiency and effectiveness of the process. *Examiner's Answer, Page 10.*

a. *The Examiner incorrectly modifies the Inoue process to include heating the crude oil fraction*

The Examiner states that, "Inoue prefers to operate the process without substantially heating the liquids to save energy." *Examiner's Answer, Page 10* (emphasis added). *The Examiner, however, does not provide any evidence that that is in fact the reason why Inoue conducts the process without heating the liquids.* In fact, Inoue states that, "thermal treatments are expensive and may, if carried out extensively, severely modify the composition of the oil." *Column 1, lines 32-33* (emphasis added). Additionally, Inoue states that, "it has been found to be possible to keep the heating of the liquid at a minimum so that the reaction effectively takes place at ambient temperature." *Column 2, lines 31-33.* As such, it can be seen that Inoue teaches the benefits of keeping the liquids at room temperature in order to avoid modifying the composition of the oil. *This is in stark contrast to Appellant's claimed invention wherein the crude oil fraction is heated in order to bring about a beneficial upgrade.*

As such, this mere assertion by the Examiner cannot be a proper basis for an obviousness rejection since the fact that a reference can be modified is not sufficient to establish *prima facie* obviousness. *M.P.E.P. § 2143.01*. As previously discussed, the Federal Circuit has explicitly held that even though a prior art device “may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so.” *In re Mills*, 916 F.2d 680, 682, 16 U.S.P.Q.2d 1430, 1432 (Fed. Cir. 1990). The Examiner has not pointed to any motivation within Inoue for conducting the process while heating the crude oil fraction and has thus failed to meet his burden of establishing a *prima facie* conclusion of obviousness.

**B. The rejection of Claims 40-57 under 35 U.S.C. § 103(a) as being unpatentable over Gunnerman is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 40-57.**

i. *The Examiner's Rejection of Independent Claim 40*

The Examiner submits in the verbatim Office Actions of August 8, 2006 and September 5, 2006 that Gunnerman discloses a process for removing sulfur from a hydrocarbon feed by preheating the feed and contacting it with an oxidizing agent while exposing the feed to sonic energy and a nickel or tungsten catalyst at a residence time of from about 0.3 minutes to about 30 minutes at a temperature of from 70°C to 80°C at about atmospheric pressure. *See col. 3, lines 18-45; col. 4, lines 38-47; col. 5, line 23 through col. 6, line 37; example 1.*

However, the Examiner concedes that Gunnerman does not disclose that the process is operated in the absence of an aqueous phase. See Office Action p. 6. To satisfy this feature, the Examiner submits that at the time the invention was made it *would have been obvious* to one having ordinary skill in the art to have modified the Gunnerman process by operating the process in the absence of an aqueous phase if the function of the aqueous phase is undesirable. See Office Action p. 6.

ii. A Review of Gunnerman

Gunnerman provides a method for reducing the sulfur content of a fossil fuel by applying ultrasound to a multiphase reaction medium containing the fossil fuel along with an aqueous fluid, a hydroperoxide oxidizing agent, and a surface active agent. See col. 2, lines 26-30. After receiving the ultrasound treatment, the reaction medium spontaneously separates into an organic phase, the latter now containing the desulfurized fossil fuel, and a separate aqueous phase, now containing the sulfur compounds. See col. 2, lines 31-43.

iii. Appellant's Independent Claim 40

Appellant's independent Claim 40 recites, *inter alia*, a process for *upgrading* a crude oil fraction to *improve the performance and enhance the utility* of the crude oil fraction, said process comprising...exposing said crude oil fraction to sonic energy in the absence of an aqueous phase. The aforementioned features recited in independent Claim 40 are not taught or suggested by Gunnerman.



- a. *There is no evidence supporting the motivation to modify the Gunnerman reference to be practiced without the use of an aqueous phase*

Gunnerman requires the presence of an aqueous phase because the Gunnerman process effectuates the removal of sulfur by allowing the aqueous and organic phases to separate after a sonic energy treatment, wherein the aqueous phase ultimately contains the sulfur products. See col. 2, lines 26-44. An aqueous phase is *essential* to Gunnerman because it is the means by which the oxidized sulfur is extracted from the fossil fuel. See col. 3, lines 1-5.

The Examiner concedes in the Office Action that Gunnerman does not disclose an operation in the absence of an aqueous phase. See p. 6. As is well known, references can be modified for purposes of a Section 103 rejection only if there is some suggestion or incentive to do so. *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); *M.P.E.P.* § 2143.01. Thus, some motivation would need to be shown in order to so drastically modify the Gunnerman process as to remove the essential element of having an aqueous phase because, “impermissible hindsight must be avoided and the [conclusion of obviousness] must be reached on the basis of the facts gleaned from the prior art.” *In re Zurko*, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001); See also *M.P.E.P.* § 2142. The Examiner failed to identify any teaching in the prior art or any evidence of the knowledge of one of ordinary skill in the art that would lead to this improper modification of Gunnerman. Since no evidence has been provided, the Examiner has not met his burden of establishing a *prima facie* case of obviousness.

b. *The case law cited by the Examiner does not provide the missing motivation to modify the Gunnerman reference*

In the Office Action, the Examiner relies on three cases to provide support for his improper finding of obviousness. These three cases are easily distinguishable from the present matter. In *Ex parte Wu*, the Board affirmed the Examiner's finding that it would have been obvious to omit a prior art element when the function attributed to that element is not desired or required. 10 U.S.P.Q.2d 2031, 2032 (BPAI 1989). The court held in *In re Larson* that if a prior art element serves a particular purpose and if that particular purpose is not desired, it would have been an obvious choice to eliminate the element and its function. 144 U.S.P.Q. 347, 350 (CCPA 1965). Finally, in *In re Kuhle* the court held that if one is simplifying a prior art reference by deleting an element, and thereby deleting the element's function, it would be an obvious expedient over the prior art. 188 U.S.P.Q. 7, 9 (CCPA 1975).

In sharp contrast to the above cases, Gunnerman absolutely requires an aqueous phase in order for its process to function as intended, and any deletion of this element would not be a simplification or the removal of an unneeded function; in fact, the ultimate separation of the organic and aqueous phases is the function of the Gunnerman process and to modify the Gunnerman reference in the manner suggested by the Examiner would render Gunnerman inoperable for its intended purpose. Such proposed modifications are inappropriate for an obviousness inquiry. See *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Accordingly, The rejection of independent Claim 40 under 35 U.S.C. § 103(a) must be reversed and the subject application remanded to the Examiner with instructions to allow Claim 40.

iv. Appellant's Dependent Claims 41-57

Further, Appellant submits that Claims 41-57 are allowable at least for the reason that these claims depend from an allowable base claim and recite additional features that further define the present invention.

Accordingly, Appellant respectfully requests that the Board reverse the rejection of dependent Claims 41-57 under 35 U.S.C. § 103(a) and remand the subject application to the Examiner with instructions to allow such claims.

**C. The rejection of Claims 58-75 under 35 U.S.C. § 103(a) as being unpatentable over Gunnerman is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 58-75.**

i. The Examiner's Rejection of Independent Claim 58

The Examiner submits in the Office Action of August 8, 2006 that Gunnerman discloses a process for removing sulfur from a hydrocarbon feed by preheating the feed and contacting it with an oxidizing agent while exposing the feed to sonic energy and a nickel or tungsten catalyst at a residence time of from about 0.3 minutes to about 30 minutes at a

temperature of from 70°C to 80°C at about atmospheric pressure. *See col. 3, lines 18-45; col. 4, lines 38-47; col. 5, line 23 through col. 6, line 37; example 1.*

However, *the Examiner concedes that Gunnerman does not disclose that the process is operated in the absence of a surface active agent.* *See Office Action p. 7.* To satisfy this feature, the Examiner speculates that at the time the invention was made it might have been obvious to one having ordinary skill in the art to have modified the Gunnerman process by operating the process in the absence of a surface active agent *if the function of the aqueous phase is undesirable.* *See Office Action p. 7.*

ii. *A Review of Gunnerman*

Gunnerman provides a method for reducing the sulfur content of a fossil fuel by applying ultrasound to a multiphase reaction medium containing the fossil fuel along with an aqueous fluid, a hydroperoxide oxidizing agent, *and a surface active agent.* *See col. 2, lines 26-30.* After receiving the ultrasound treatment, the reaction medium spontaneously separates into an organic phase, now containing the desulfurized fossil fuel, and an aqueous phase, now containing the sulfur compounds. *See col. 2, lines 31-43.*

iii. *Appellant's Independent Claim 58*

Appellant's independent Claim 58 recites, *inter alia*, a process for *upgrading* a crude oil fraction to *improve the performance and enhance the utility* of the crude oil fraction, said process comprising...exposing said crude oil fraction to sonic energy *in the absence of a surface active agent.* The aforementioned features recited in independent Claim 58 are not taught or suggested by Gunnerman.

- a. *There is no evidence supporting the motivation to modify  
Gunnerman to be practiced without the use of a surface  
active agent*

Gunnerman requires the presence of a surface active agent because the Gunnerman process effectuates the removal of sulfur by allowing the aqueous and organic phases to separate after a sonic energy treatment, wherein the aqueous phase ultimately contains the sulfur products. *See col. 2, lines 26-44.* A surface active agent is essential to Gunnerman because it allows for the formation of an emulsion between the fossil fuel and the aqueous phase, thereby enabling the oxidized sulfur to be extracted from the fossil fuel. *See col. 4, line 61 to col. 5, line 1.*

The Examiner concedes in the Office Action that Gunnerman does not disclose an operation in the absence of a surface active agent. *See p. 7.* As is well known, references can be modified for purposes of a Section 103 rejection only if there is some suggestion or incentive to do so. *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); *M.P.E.P.* § 2143.01. Thus, some motivation would need to be shown in order to so drastically modify the Gunnerman process as to remove the essential element of having a surface active agent because, “impermissible hindsight must be avoided and the [conclusion of obviousness] must be reached on the basis of the facts gleaned from the prior art.” *In re Zurko*, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001); *See also M.P.E.P.* § 2142. The Examiner failed to identify any teaching in the prior art or any evidence whatsoever of the knowledge of one of ordinary skill in the art that would lead to this improper modification of Gunnerman. Since no evidence has been provided, the Examiner has not met his burden of establishing a *prima facie* case of obviousness.

b. *The case law cited by the Examiner does not provide the missing motivation to modify the Gunnerman reference*

In the Office Action, the Examiner relies on three cases to provide support for his improper finding of obviousness<sup>1</sup>. These three cases are easily distinguishable from the present matter.

In sharp contrast to the above cases, Gunnerman requires a surface active agent in order for its process to function as intended, and any deletion of this element would not be a simplification or the removal of an unneeded function; in fact, the ultimate separation of the organic and aqueous phases is the function of the Gunnerman process and to modify the Gunnerman reference in the manner suggested by the Examiner would render Gunnerman inoperable for its intended purpose. Such proposed modifications are inappropriate for an obviousness inquiry. See *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

c. *There is no explanation of the motivation to modify Gunnerman to omit the use of a surface active agent*

In the Office Action, the Examiner speculates that Claim 58 *would* have been obvious over Gunnerman, “if the function of the aqueous phase is undesirable.” Page 7. However, Appellant’s independent Claim 58 does not include the limitation of an aqueous phase. The rejection is therefore nonsensical. Assuming the Examiner intended to assert an obviousness rejection if the function of a surface active agent were undesirable, that rationale is clearly without support and thus also inappropriate. As discussed above, the Examiner has not provided any evidence supporting the motivation to modify Gunnerman by removing the

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<sup>1</sup> For the sake of completely arguing each ground of rejection, these three cases and their holdings are discussed above in relation to the rejection of Claims 40-57, and later herein with respect to Claims 78-88.

surface active agent, which is a required element for the functionality of the Gunnerman process.

As is well known, the record must point to some evidence establishing a suggestion or incentive in the prior art for making the proposed modification, without using the applicant's disclosure as the road map. *See M.P.E.P. §§ 2142, 2143.01*. Not only did the Examiner not provide any such evidence, but in this rejection there is no explanation for the motivation to modify the teachings of Gunnerman to remove the essential surface active agent from the Gunnerman process.

Accordingly, the Board must reverse the rejection of independent Claim 58 under 35 U.S.C. § 103(a) and remand the subject application to the Examiner with instructions to allow Claim 58.

iv. Appellant's Dependent Claims 59-75

Further, Appellant submits that Claims 59-75 are allowable at least for the reason that these claims depend from an allowable base claim and recite additional features that further define the present invention.

Accordingly, the Board must reverse the rejection of Claims 59-75 under 35 U.S.C. § 103(a) and remand the subject application to the Examiner with instructions to allow such claims.

**D. The rejection of Claims 78-88 under 35 U.S.C. § 103(a) as being unpatentable over Gunnerman is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 78-88.**

i. The Examiner's Rejection of Claims 78-88

The Examiner submits in the Office Action of August 8, 2006 that Gunnerman discloses a process for removing sulfur from a hydrocarbon feed by preheating the feed and contacting it with an oxidizing agent while exposing the feed to sonic energy and a nickel or tungsten catalyst at a residence time of from about 0.3 minutes to about 30 minutes at a temperature of from 70°C to 80°C at about atmospheric pressure. *See col. 3, lines 18-45; col. 4, lines 38-47; col. 5, line 23 through col. 6, line 37; example 1.*

However, the Examiner concedes that Gunnerman does not disclose that the process is operated in the absence of an oxidizing agent. *See Office Action p. 7.* To satisfy this feature, the Examiner speculates that at the time the invention was made *it would have been obvious* to one having ordinary skill in the art to have modified the Gunnerman process by operating the process in the absence of an oxidizing agent *if the function of the aqueous phase is undesirable.* *See Office Action p. 7.*

ii. A Review of Gunnerman

Gunnerman provides a method for reducing the sulfur content of a fossil fuel by applying ultrasound to a multiphase reaction medium containing the fossil fuel along with an aqueous fluid, a hydroperoxide oxidizing agent, and a surface active agent. *See col. 2, lines*



26-30. After receiving the ultrasound treatment, the reaction medium spontaneously separates into an organic phase, now containing the desulfurized fossil fuel, and an aqueous phase, now containing the sulfur compounds. *See col. 2, lines 31-43.*

iii. Appellant's Claims 78-88

Appellant's Claims 78-88 are dependent on base Claim 76 which recites, *inter alia*, a process for *upgrading* a crude oil fraction to *improve the performance and enhance the utility* of the crude oil fraction, said process comprising...*in the absence of an oxidizing agent*...exposing said crude oil fraction to sonic energy. The aforementioned features recited in independent Claim 76 are clearly not taught or suggested by Gunnerman, and are in fact opposite to those teachings. Accordingly, Appellant's Claims 78-88 which depend on Claim 76 are likewise not taught or suggested by Gunnerman.

a. *There is no evidence supporting the motivation to modify*

*Gunnerman to omit the use of an oxidizing agent*

*Gunnerman requires the presence of an oxidizing agent* because the Gunnerman process effectuates the removal of sulfur by oxidizing the sulfides present in the fossil fuel to sulfones which have greater solubility in the aqueous phase. *See col. 3, lines 1-5; col. 5, lines 41-46.* In no way does the Gunnerman reference give *any* indication that the process *could be modified* by removing the hydroperoxide oxidizing agent and still be functional.

In fact, *the Examiner expressly concedes in the Office Action that Gunnerman does not disclose an operation in the absence of an oxidizing agent.* *See Office Action p. 7.* As is well known, references can be modified for purposes of a Section 103 rejection *only if*

**there is some suggestion or incentive to do so.** *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); *M.P.E.P.* § 2143.01. Thus, some motivation would need to be shown in order to so drastically modify the Gunnerman process as to remove the essential element of having an oxidizing agent because, “impermissible hindsight must be avoided and the [conclusion of obviousness] must be reached on the basis of the facts gleaned from the prior art.” *In re Zurko*, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001); *See also M.P.E.P.* § 2142. The Office Action fails to identify any teaching in the prior art or any evidence of the knowledge of one of ordinary skill in the art that would lead to this improper modification of Gunnerman. Since no evidence has been provided, a *prima facie* case of obviousness has not been established.

b. *The case law cited by the Examiner does not provide the missing motivation to modify the Gunnerman reference*

In the Office Action, the Examiner relies on three cases to provide support for his improper finding of obviousness<sup>2</sup>. These three cases are easily distinguishable from the present matter.

In sharp contrast to the above cases, **Gunnerman requires an oxidizing agent in order for its process to function as intended**, and any deletion of this element would not be a simplification or the removal of an unneeded function; in fact, **the oxidation of the sulfides to sulfones so that the sulfones may be isolated in the aqueous phase is the function of the Gunnerman process** and to modify the Gunnerman reference in the manner suggested by the Examiner would render Gunnerman inoperable for its intended purpose. Such proposed

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<sup>2</sup> For the sake of completely arguing each ground of rejection, these three cases and their holdings are discussed above in relation to the rejection of Claims 40-57, and again with respect to Claims 58-75.

modifications are inappropriate for an obviousness inquiry. *See In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

*c. There is no explanation of the motivation to modify  
Gunnerman to omit the use of an oxidizing agent*

In the Office Action, the Examiner assumes that Claims 78-88 would have been obvious over Gunnerman, “if the function of the aqueous phase is undesirable.” *Page 7. However, Claims 78-88 do not include the limitation of an aqueous phase.* Like the rejection set forth above in relation to Claims 58-75 the rejection is nonsensical. Assuming, *arguendo*, the Examiner intended to assert an obviousness rejection if the function of an oxidizing agent were undesirable, that rationale is clearly without support and thus inappropriate. As discussed above, no evidence has been provided to support the motivation to modify Gunnerman by removing the oxidizing agent, which is a required element for the functionality of the Gunnerman process.

As is well known, the record must point to some evidence establishing a suggestion or incentive in the prior art for making the proposed modification, without using the applicant’s disclosure as the road map. *See M.P.E.P. §§ 2142, 2143.01*. Not only does the record fail to provide any such evidence, but in this rejection there is further lacking any explanation for the motivation to modify the teachings of Gunnerman to remove the essential oxidizing agent from the Gunnerman process.

Accordingly, no basis for maintaining a rejection of these claims exists and the Board should reverse the rejection of Claims 78-88 under 35 U.S.C. § 103(a) and remand the subject application to the Examiner with instructions to allow such claims.

E. **The rejection of Claims 76 and 83-88 under 35 U.S.C. § 102(b) as being anticipated by Inoue is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 76 and 83-88.**

i. *The Examiner's Rejection of Independent Claim 76*

The Examiner submits in the Office Action of August 8, 2006 that Inoue discloses a desulfurization process wherein a hydrocarbon feed (e.g., crude oil) is contacted with ultrasonic energy, wherein the process is operated at ambient temperature and pressure. *See col. 1, lines 27-38; col. 2, lines 20-44; col. 5, lines 5-8; Examples I-V.*

ii. *A Review of Inoue*

Inoue discloses a method for removing sulfur from petroleum liquids by exposing the liquids to high-energy sources *without substantially heating the liquids*. *See col. 1, lines 51-64.* Inoue discloses that sonic vibrations alone or in combination with some other high-energy source can result in the desulfurization of the petroleum liquids. *See col. 2, lines 34-43.* Inoue also discloses that in spite of using a high-energy discharge the liquid is only minimally heated from the process and *the reaction effectively occurs at ambient temperature* and pressure. *See col. 2, lines 30-33.*

iii. *Appellant's Independent Claim 76*

Appellant's independent Claim 76 recites, *inter alia*, [a] process for *upgrading* a crude oil fraction *to improve the performance and enhance the utility* of the crude oil

fraction, said process comprising the step of heating said crude oil fraction ... The aforementioned features recited in independent Claim 76 are not taught or suggested by Inoue.

a. *The Inoue patent does not teach heating a crude oil fraction*

The rejection of independent Claim 76 as anticipated by Inoue is untenable. Independent Claim 76 specifically requires the step of heating the crude oil fraction while exposing the crude oil fraction to sonic energy. Inoue, in contrast, fails to teach heating the crude oil fraction while applying sonic energy. Inoue states that its method, “may be used to treat the sulfur-containing liquid without substantial heating thereof,” (Col. 1, lines 57-59) (emphasis added) and that, “in spite of the use of high-energy discharge, it has been found to be possible to keep the heating of the liquid at a minimum so that the reaction effectively takes place at ambient temperature or pressure.” *Col. 2, lines 30-33* (emphasis added). In fact, the Examiner conceded that the Inoue “process is operated at ambient temperature and pressure.” *Office Action p. 8*.

As such, the Inoue reference does not teach all of the limitations present in Appellant’s independent Claim 76. As is well known, a prior art reference cannot anticipate in terms of 35 U.S.C. § 102 unless every element of the claimed invention is identically shown in a single reference. *In re Bond*, 15 U.S.P.Q. 2d, 1566, 1567 (Fed. Cir 1990); *M.P.E.P. § 2131*. Therefore, Appellant submits that the Examiner has failed to establish an adequate evidentiary basis to support an anticipation rejection under 35 U.S.C. § 102(b), and that the current rejection of independent Claim 76 is improper and should be withdrawn.

b. *The Inoue patent teaches away from heating the crude oil fraction*

Not only does the Inoue reference not teach the limitation of heating the crude oil fraction as required by Appellant's independent Claim 76, the Inoue reference actually teaches away from heating the crude oil fraction. Inoue states that, "thermal treatments are expensive and may, if carried out extensively, severely modify the composition of the oil." *Col. 1, lines 32-33*. Accordingly, there would be no motivation whatsoever to modify the Inoue reference to teach all of the limitations present in Appellant's independent Claim 76. It is well known that when analyzing an invention for obviousness the prior art must be considered in its entirety, including disclosures that teach away from the claims. *M.P.E.P. § 2141.02*. As such, any 35 U.S.C. § 103(a) rejection of Appellant's independent Claim 76 would also be improper.

iv. *Appellant's Dependent Claims 83-88*

Further, Appellant submits that Claims 83-88 are allowable at least for the reason that these claims depend from an allowable base claim and recite additional features that further define the present invention.

Accordingly, Appellant respectfully requests that the Board reverse the rejection of dependent Claims 83-88 under 35 U.S.C. § 102(b) and remand the subject application to the Examiner with instructions to allow such claims.

**F. The rejection of Claims 77-81 under 35 U.S.C. § 103(a) as being unpatentable over Inoue in view of Gunnerman is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 77-81.**

i. *The Examiner's Rejection of Claims 77-81*

The Examiner submits in the Office Action of August 8, 2006 that Inoue discloses a desulfurization process wherein a hydrocarbon feed (e.g., crude oil) is contacted with ultrasonic energy, wherein the process is operated at ambient temperature and pressure. *See col. 1, lines 27-38; col. 2, lines 20-44; col. 5, lines 5-8; Examples I-V.*

The Examiner further submits that Gunnerman discloses a process for removing sulfur from a hydrocarbon feed by preheating the feed and contacting it with an oxidizing agent while exposing the feed to sonic energy and a nickel or tungsten catalyst at a residence time of from about 0.3 minutes to about 30 minutes at a temperature of from 70°C to 80°C at about atmospheric pressure. *See col. 3, lines 18-45; col. 4, lines 38-47; col. 5, line 23 through col. 6, line 37; example 1.*

However, the Examiner concedes that Inoue does not disclose crude oil fraction feeds as recited in Appellant's Claims 77-81. *See Office Action p. 8.* To satisfy this feature, the Examiner speculates that at the time the invention was made it would have been obvious to one having ordinary skill in the art to have modified the Inoue process by utilizing a feedstock as taught by Gunnerman because any sulfur containing hydrocarbon feed can be treated in the process of Inoue. *See Office Action p. 8.*

ii. A Review of Inoue

Inoue discloses a method for removing sulfur from petroleum liquids by exposing the liquids to high-energy sources without substantially heating the liquids. *See col. 1, lines 51-64.* Inoue discloses that sonic vibrations alone or in combination with some other high-energy source can result in the desulfurization of the petroleum liquids. *See col. 2, lines 34-43.* Inoue also discloses that in spite of using a high-energy discharge the liquid is only minimally heated from the process and the reaction effectively occurs at ambient temperature and pressure. *See col. 2, lines 30-33.*

iii. A Review of Gunnerman

Gunnerman provides a method for reducing the sulfur content of a fossil fuel by applying ultrasound to a multiphase reaction medium containing the fossil fuel along with an aqueous fluid, a hydroperoxide oxidizing agent, and a surface active agent. *See col. 2, lines 26-30.* After receiving the ultrasound treatment, the reaction medium spontaneously separates into an organic phase, now containing the desulfurized fossil fuel, and an aqueous phase, now containing the sulfur compounds. *See col. 2, lines 31-43.*

iv. Appellant's Claims 77-81

Appellant's Claims 77-81 are dependent from base Claim 76 which recites, inter alia, a process for *upgrading* a crude oil fraction to *improve the performance and enhance the utility* of the crude oil fraction, said process comprising the step of heating said crude oil fraction in the absence of an oxidizing agent.... Appellant respectfully submits that the aforementioned features recited in independent Claim 76 are not taught or suggested by



Inoue or Gunnerman. Accordingly, Appellant's Claims 77-81 which depend from Claim 76 are likewise not taught or suggested by Inoue or Gunnerman.

a. *Appellant's independent Claim 76 has been shown above to be allowable; therefore, dependent Claims 77-81 are likewise allowable*

The further rejection of Claims 77-81 under 103(a) as being unpatentable over Inoue in view of Gunnerman is improper for the reasons discussed above in relation to the Examiner's rejection of Appellant's independent Claim 76 under 35 U.S.C. § 102(b), as well as Examiner's rejection of Claims 77-81 under 35 U.S.C. § 103(a).

In particular, Claims 77-81 which depend from Claim 76 include the step of heating the crude oil fraction. Inoue clearly does not teach heating the crude oil fraction. In fact, as discussed above, Inoue teaches away from heating the crude oil fraction. Furthermore, Claims 77-81 require the process to occur in the absence of an oxidizing agent. Gunnerman absolutely requires the presence of a hydroperoxide oxidizing agent in order to effectuate its process. To so modify Inoue and Gunnerman as to reach the process recited in Claims 77-81 would not only contradict their respective teachings but, in the case of Gunnerman would render it unsuitable for its intended purpose. Such proposed modifications are inappropriate for an obviousness inquiry. See *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Accordingly, Appellant respectfully requests that the Board reverse the rejection of Claims 77-81 under 35 U.S.C. § 103(a) and remand the subject application to the Examiner with instructions to allow such Claims.

**G. The rejection of Claim 82 under 35 U.S.C. § 103(a) as being unpatentable over Inoue alone or in view of Gunnerman is in error, the rejection should be reversed, and the subject application should be remanded to the Examiner with instructions to allow Claims 82.**

i. *The Examiner's Rejection of Claim 82*

The Examiner submits in the Office Action of August 8, 2006 that Inoue discloses a desulfurization process wherein a hydrocarbon feed (e.g., crude oil) is contacted with ultrasonic energy, wherein the process is operated at ambient temperature and pressure. *See col. 1, lines 27-38; col. 2, lines 20-44; col. 5, lines 5-8; Examples I-V.*

The Examiner further submits that Gunnerman discloses a process for removing sulfur from a hydrocarbon feed by preheating the feed and contacting it with an oxidizing agent while exposing the feed to sonic energy and a nickel or tungsten catalyst at a residence time of from about 0.3 minutes to about 30 minutes at a temperature of from 70°C to 80°C at about atmospheric pressure. *See col. 3, lines 18-45; col. 4, lines 38-47; col. 5, line 23 through col. 6, line 37; example 1.*

However, the Examiner concedes that Inoue does not disclose that the process has a residence time of from one second to one minute. *See Office Action p. 9.* To satisfy this feature, the Examiner submits that at the time the invention was made it would have been obvious to one having ordinary skill in the art to have modified the Inoue process by operating the process at the claimed residence times because it would be expected that at least one sulfur would be released from the feedstock when the resident time is one minute. *See Office Action p. 9.* The Examiner submits that in the alternative, it would have been

obvious to one skilled in the art at the time the invention was made to have modified the process of Inoue by operating the residence times as taught by Gunnerman because such residence times are effective in the Gunnerman process. *See Office Action p. 9.*

ii. *A Review of Inoue*

Inoue discloses a method for removing sulfur from petroleum liquids by exposing the liquids to high-energy sources without substantially heating the liquids. *See col. 1, lines 51-64.* Inoue discloses that sonic vibrations alone or in combination with some other high-energy source can result in the desulfurization of the petroleum liquids. *See col. 2, lines 34-43.* Inoue also discloses that in spite of using a high-energy discharge the liquid is only minimally heated from the process and the reaction effectively occurs at ambient temperature and pressure. *See col. 2, lines 30-33.*

iii. *A Review of Gunnerman*

Gunnerman provides a method for reducing the sulfur content of a fossil fuel by applying ultrasound to a multiphase reaction medium containing the fossil fuel along with an aqueous fluid, a hydroperoxide oxidizing agent, and a surface active agent. *See col. 2, lines 26-30.* After receiving the ultrasound treatment, the reaction medium spontaneously separates into an organic phase, now containing the desulfurized fossil fuel, and an aqueous phase, now containing the sulfur compounds. *See col. 2, lines 31-43.*

iv. Appellant's Claim 82

Appellant's Claim 82 is dependent from base Claim 76 which recites, *inter alia*, a process for *upgrading* a crude oil fraction to *improve the performance and enhance the utility* of the crude oil fraction, said process comprising the step of *heating said crude oil fraction in the absence of an oxidizing agent*.... The aforementioned features recited in independent Claim 76 *are not taught or suggested by Inoue or Gunnerman*, either alone or in combination. Accordingly, Appellant's Claim 82, which depends from Claim 76, is likewise not taught or suggested by Inoue and Gunnerman.

a. *Appellant's independent Claim 76 has been shown above to be allowable; therefore, dependent Claim 82 is likewise allowable*

The further rejection of Claim 82 under 103(a) as being unpatentable over Inoue alone or in view of Gunnerman is improper for the reasons discussed above in relation to the Examiner's rejection of Appellant's Claims 77-81 under 35 U.S.C. § 103(a).

Claim 82, which depends from Claim 76, includes the step of *heating the crude oil fraction*. Inoue fails to teach heating the crude oil fraction. In fact, as discussed above, *Inoue teaches away from heating the crude oil fraction*. Furthermore, Claim 82 requires the process to occur *in the absence of an oxidizing agent*. Gunnerman absolutely requires the presence of a hydroperoxide oxidizing agent in order to effectuate its process. To so modify Inoue and Gunnerman as to reach the process recited in Claim 82 would not only contradict their respective teachings but, in the case of Gunnerman would render it unsuitable for its intended purpose. As repeatedly discussed above, such proposed modifications are

inappropriate for an obviousness inquiry. *See In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Accordingly, the rejection of Claim 82 under 35 U.S.C. § 103(a) must be reversed and the subject application remanded to the Examiner with instructions to allow such Claims.

**H. All rejections not discussed above have been expressly withdrawn by the Examiner in the Answer Brief.**

All rejections that were included in the final Office Action of August 8, 2006 and were not discussed above have been expressly withdrawn by the Examiner in the Answer Brief of February 14, 2007. The withdrawn rejections include: the rejection of Claims 40-88 under 35 U.S.C. § 112, first paragraph; the rejection of Claims 40-48 under 35 U.S.C. § 112, first paragraph; the rejection of Claims 41 and 48-51 under 35 U.S.C. § 112, second paragraph; the rejections of Claims 40 and 41 under the judicially created doctrine of obviousness-type double patenting; and the rejection of Claims 40-46 under the judicially created doctrine of obviousness-type double patenting. Since these rejections have been withdrawn by the Examiner they have not been discussed herein.

## CLAIMS APPENDIX

40. A process for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, said process comprising the step of heating said crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of an aqueous phase.

41. The process of Claim 40 wherein said oxidizing agent is hydrogen peroxide or a hydroperoxide.

42. The process of Claim 40 wherein said crude oil fraction is a fraction boiling within the diesel range.

43. The process of Claim 42 wherein said crude oil fraction is a member selected from the group consisting of fluid catalytic cracking (FCC) cycle oil fractions, coker distillate fractions, straight run diesel fractions, and blends thereof.

44. The process of Claim 40 wherein said crude oil fraction is a fraction boiling within the gas oil range.

45. The process of Claim 44 wherein said crude oil fraction is a member selected from the group consisting of FCC cycle oil, FCC slurry oil, light gas oil, heavy gas oil, and coker gas oil.

46. The process of Claim 40 wherein said crude oil fraction is a member selected from the group consisting of gasoline, jet fuel, straight-run diesel, blends of straight-run diesel and FCC light cycle oil, and petroleum residuum-based fuel oils.

47. The process of Claim 40 wherein said crude oil fraction is exposed to said sonic energy from about 1 second to about 1 minute.

48. The process of Claim 41 further comprising contacting said crude oil fraction with a transition metal catalyst.

49. The process of Claim 48 wherein said transition metal catalyst is a member selected from the group consisting of metals having atomic numbers of 21 through 29, 39 through 47, 57 through 79.

50. The process of Claim 48 wherein said transition metal catalyst is a member selected from the group consisting of nickel, silver, tungsten, cobalt, molybdenum, and combinations thereof.

51. The process of Claim 48 wherein said transition metal catalyst is a member selected from the group consisting of nickel, silver, tungsten, and combinations thereof.

52. The process of Claim 40 wherein said crude oil fraction is heated to a temperature no greater than 500°C.

53. The process of Claim 40 wherein said crude oil fraction is heated to a temperature no greater than 200°C.

54. The process of Claim 40 wherein said crude oil fraction is heated to a temperature no greater than 125°C.

55. The process of Claim 40 performed at a pressure of less than 400 psia.

56. The process of Claim 40 performed at a pressure of less than 50 psia.

57. The process of Claim 40 performed at a pressure within the range of from about atmospheric pressure to about 50 psia.

58. A process for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, said process comprising the step of heating said

crude oil fraction in the presence of an oxidizing agent while exposing said crude oil fraction to sonic energy in the absence of a surface active agent.

59. The process of Claim 58 wherein said oxidizing agent is hydrogen peroxide or a hydroperoxide.

60. The process of Claim 58 wherein said crude oil fraction is a fraction boiling within the diesel range.

61. The process of Claim 60 wherein said crude oil fraction is a member selected from the group consisting of fluid catalytic cracking (FCC) cycle oil fractions, coker distillate fractions, straight run diesel fractions, and blends thereof.

62. The process of Claim 58 wherein said crude oil fraction is a fraction boiling within the gas oil range.

63. The process of Claim 62 wherein said crude oil fraction is a member selected from the group consisting of FCC cycle oil, FCC slurry oil, light gas oil, heavy gas oil, and coker gas oil.

64. The process of Claim 58 wherein said crude oil fraction is a member selected from the group consisting of gasoline, jet fuel, straight-run diesel, blends of straight-run diesel and FCC light cycle oil, and petroleum residuum-based fuel oils.

65. The process of Claim 58 wherein said crude oil fraction is exposed to said sonic energy from about 1 second to about 1 minute.

66. The process of Claim 59 further comprising contacting said crude oil fraction with a transition metal catalyst.



67. The process of Claim 66 wherein said transition metal catalyst is a member selected from the group consisting of metals having atomic numbers of 21 through 29, 39 through 47, 57 through 79.

68. The process of Claim 66 wherein said transition metal catalyst is a member selected from the group consisting of nickel, silver, tungsten, cobalt, molybdenum, and combinations thereof.

69. The process of Claim 66 wherein said transition metal catalyst is a member selected from the group consisting of nickel, silver, tungsten, and combinations thereof.

70. The process of Claim 58 wherein said crude oil fraction is heated to a temperature no greater than 500°C.

71. The process of Claim 58 wherein said crude oil fraction is heated to a temperature no greater than 200°C.

72. The process of Claim 58 wherein said crude oil fraction is heated to a temperature no greater than 125°C.

73. The process of Claim 58 performed at a pressure of less than 400 psia.

74. The process of Claim 58 performed at a pressure of less than 50 psia.

75. The process of Claim 58 performed at a pressure within the range of from about atmospheric pressure to about 50 psia.

76. A process for upgrading a crude oil fraction to improve the performance and enhance the utility of the crude oil fraction, said process comprising the step of heating said crude oil fraction in the absence of an oxidizing agent while exposing said crude oil fraction to sonic energy.

77. The process of Claim 76 wherein said crude oil fraction is a fraction boiling within the diesel range.

78. The process of Claim 77 wherein said crude oil fraction is a member selected from the group consisting of fluid catalytic cracking (FCC) cycle oil fractions, coker distillate fractions, straight run diesel fractions, and blends thereof.

79. The process of Claim 76 wherein said crude oil fraction is a fraction boiling within the gas oil range.

80. The process of Claim 79 wherein said crude oil fraction is a member selected from the group consisting of FCC cycle oil, FCC slurry oil, light gas oil, heavy gas oil, and coker gas oil.

81. The process of Claim 76 wherein said crude oil fraction is a member selected from the group consisting of gasoline, jet fuel, straight-run diesel, blends of straight-run diesel and FCC light cycle oil, and petroleum residuum-based fuel oils.

82. The process of Claim 76 wherein said crude oil fraction is exposed to said sonic energy from about 1 second to about 1 minute.

83. The process of Claim 76 wherein said crude oil fraction is heated to a temperature no greater than 500°C.

84. The process of Claim 76 wherein said crude oil fraction is heated to a temperature no greater than 200°C.

85. The process of Claim 76 wherein said crude oil fraction is heated to a temperature no greater than 125°C.

86. The process of Claim 76 performed at a pressure of less than 400 psia.

87. The process of Claim 76 performed at a pressure of less than 50 psia.

88. The process of Claim 76 performed at a pressure within the range of from about atmospheric pressure to about 50 psia.

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**VIII. EVIDENCE APPENDIX**

None.

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**IX. RELATED PROCEEDINGS APPENDIX**

None.

## **XI. CONCLUSION**

In view of the foregoing, it is submitted that none of the references of record, when considered either alone or in any proper combination thereof, anticipates or renders obvious the Appellant's invention as recited in Claims 40-88. The applied references of record have been discussed and distinguished, while significant claimed features of the present invention have repeatedly been pointed out.

As such, each and every appealed claim of the present invention meets the requirements for patentability under 35 U.S.C. § 103. Appellant therefore requests that all of the aforementioned rejections be reversed by the Board, and that the application be remanded to the Examiner for withdrawal of the rejections.

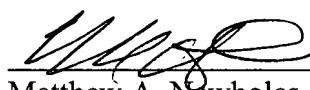
Accordingly, allowance of the present application and the above-mentioned claims therein is respectfully requested and believed to be appropriate.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

Date: 7/5/07

By:



Customer No.: 007663

Matthew A. Newboles  
Registration No. 36,224  
STETINA BRUNDA GARRED & BRUCKER  
75 Enterprise, Suite 250  
Aliso Viejo, California 92656  
Telephone: (949) 855-1246  
Fax: (949) 855-6371